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same assignee of the application. This contention, however, is respectfully traversed because the pending claims are distinctly patentable.

Claim 1, for example, recites "a processing module coupled to receive and process said curvature signal and operable to compute stresses of each line feature on said substrate from an analytical function of curvatures in two different directions of the substrate corresponding to the location of the line feature" (emphasis added). Hence, this quoted language of Claim 1 includes two distinctive features.

First, the recited processing module is to compute stresses of each line feature on the underlying substrate. This feature is entirely different from analysis of the stresses in the underlying substrate because formation of the line features over the substrate changes the overall structure. As a result of the presence of the line features, the interaction and interfacing between the line features and the substrate complicate mechanical and other responses or properties of the entire structure. The combination system in Claim 1 provides a mechanism to determine the stresses of the line features formed on the substrate.

Claims 1-7 in U.S. Patent No. 6,031,611 describe optical coherent gradient sensing (CGS) systems to measure the curvatures of a surface of a substrate only, without the line features formed thereon. U.S. Patent No. 6,031,611 suggests in

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Columns 13 and 14 that stresses of the substrate under the CGS measurement can be determined based on the measured surface curvatures of the substrate. Claim 8 in the '611 patent specifically claims this aspect.

However, contrary to the contention of the Final Office Action, the entire disclosure of the U.S. Patent No. 6,031,611, including the cited Claims 1-8 concerns only the stresses on the surface of the substrate at the best. Nothing in the '611 patent provides any clue or indication as to stresses on line features formed on the substrate. For this reason alone, Claim 1 and its claims 2-5 are distinctly patentable over the U.S. Patent No. 6,031,611.

Second, the recited processing module in Claim 1 is to use an analytical function of curvatures in two different directions of the substrate corresponding to the location of the line feature in computation of the stresses of the line feature on the substrate. This aspect of using an analytical function in Claim 1 is fully supported by Equation (1) on page 19 of the specification and associated description and figures. Since the U.S. Patent No. 6,031,611 fails to describe a structure with line features formed on a substrate, it certainly cannot disclose this aspect of Claim 1. This further shows that Claim 1 is patentable over U.S. Patent No. 6,031,611.

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Third, the recited processing module in Claim 1 does not operate based on the curvatures of the line feature as the conventional wisdom may suggest. Rather, it uses the certain curvatures of the underlying substrate, not the curvatures of the subject line feature, to compute the stresses of the line feature. Hence, direct measurements of the curvatures of the line features are not required under Claim 1 and other pending claims. In practice, this turns out to be of a great advantage because the curvatures of line features, especially for small line features in compact systems such as integrated circuits, MEMS devices, and various micro structures, are difficult to measure with desired accuracy or precision. In comparison, U.S. Patent No. 6,031,611 only discloses that stresses of a substrate may be determined based on its own curvatures. Hence, once again, U.S. Patent No. 6,031,611 fails to support the rejections.

The above features of Claim 1 and other pending claims has a number of advantages which are completely absent from the teaching of the cited U.S. Patent No. 6,031,611. For example, line 21, page 20 to line 22, page 21 of the specification provides the following:

*Another feature of this method is that Equation (1) is a simple analytical formula and hence the stress computation based on the measured curvatures  $k_1$  and  $k_2$  can be carried out by a processor in a short time.*

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For example, a microprocessor can be used to implement a computer routine to carry out the computation shown in Equation (1). Hence, complex and time-consuming numerical computations are essentially avoided. In addition, the simple analytical formula in Equation (1) has been shown to be accurate in comparison with complex numerical computations based on finite element analysis (Wikstrom et al., *supra*). This feature of the data processing module, when combined with the full-field parallel processing of the CGS optical detection module, allows the stress measurement system 100 of FIG. 1 to measure the curvatures of a location and generate the respective stresses at a relatively high speed. Therefore, the system 100 may be used to measure temporal changes of curvatures and associated stresses of a line feature in real time for many processes of semiconductor fabrication.

The above stress computation method with respect to Equation (1) provides a way of obtaining stress data of a line feature on a substrate if the information on a thin film from which the line feature is formed is not available. An example of this situation is to determine the stresses in a device after the line feature is formed from a thin film such as a completed IC circuit.

The above and other advantages and applications of the present invention further illustrate the distinctions between the pending claims and the U.S. Patent No. 6,031,611.

Based on the above, Applicants respectfully suggest that Claim 1, and its dependent claims 2-5, are distinctly different from and thus are patentable over the '611 patent. As such, the rejections should be withdrawn.

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Another set of claims, 6-9, is also patentable over Claims 1-8 of the '611 patent. Claim 6 recites "a third mechanism to compute the stresses on the line feature based on measured first and second curvatures according to an analytical function." The disclosure of the '611 patent fails to suggest such a third mechanism that (1) computes the stresses on the line feature and (2) does so according to an analytical function. Hence, Claims 6-9 are not obvious over the '611 patent based on similar reasons stated for Claim 1 and the rejections should be withdrawn.

## **2. Double Patenting over U.S. Patent No. 6,600,565**

Claims 1-9 of this application also stand finally rejected as being obvious over Claims 7, 14, 17, 18, 23, and 26 of the '565 patent which is the parent case of this application and is owned by the same assignee of the application. These rejections, however, have been fully obviated by concurrently filing a terminal disclaimer as suggested by the Examiner. Therefore, the rejections should be withdrawn.

In view of the above, each rejection to the pending claims 1-9 has been fully addressed, resolved because each rejection should be withdrawn. Claims 1-9 are now patentable. Accordingly, the application is now in full condition for allowance.